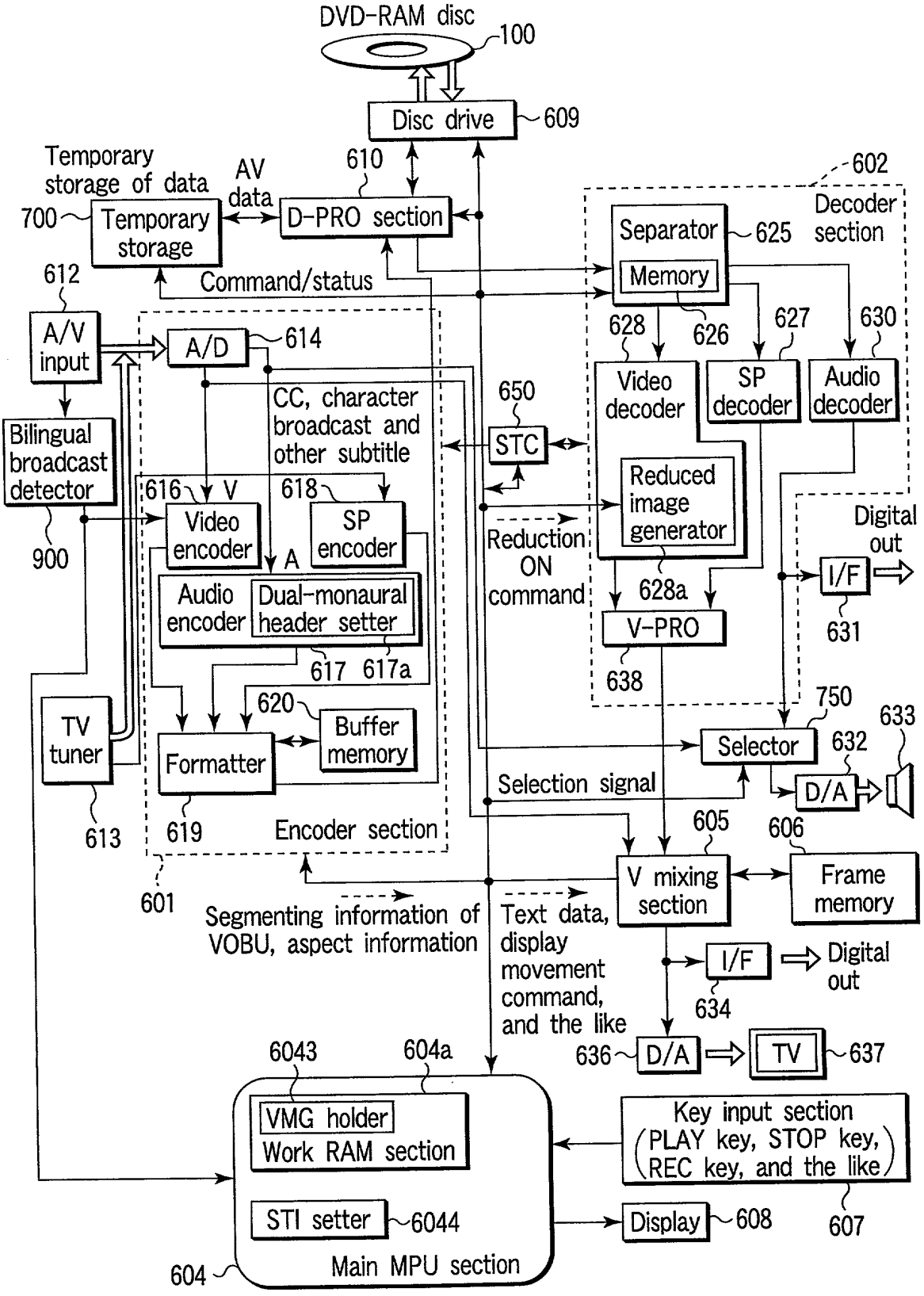

DVD-RAM disc
100
Disc drive
609
Temporary storage of data
700
Temporary storage
AV data
610
D-PRO section
602
Decoder section
Separator
625
Memory
Command/status
612
A/V input
A/D
614
CC, character broadcast and other subtitle
650
STC
628
626
627
630
Video decoder
SP decoder
Audio decoder
Bilingual broadcast detector
900
616
V
618
Video encoder
SP encoder
A
Audio encoder
Dual-monaural header setter
617
617a
Reduced image generator
Reduction ON command
Digital out
I/F
631
628a
V-PRO
638
TV tuner
613
620
Buffer memory
Formatter
619
Encoder section
601
750
Selector
633
632
D/A
Selection signal
605
606
V mixing section
Frame memory
Segmenting information of VOBU, aspect information
Text data, display movement command, and the like
I/F
Digital out
634
636
D/A
TV
637
6043
604a
VMG holder
Work RAM section
Key input section
(PLAY key, STOP key, REC key, and the like)
STI setter
6044
Display
608
607
604
Main MPU section

FIG. 1

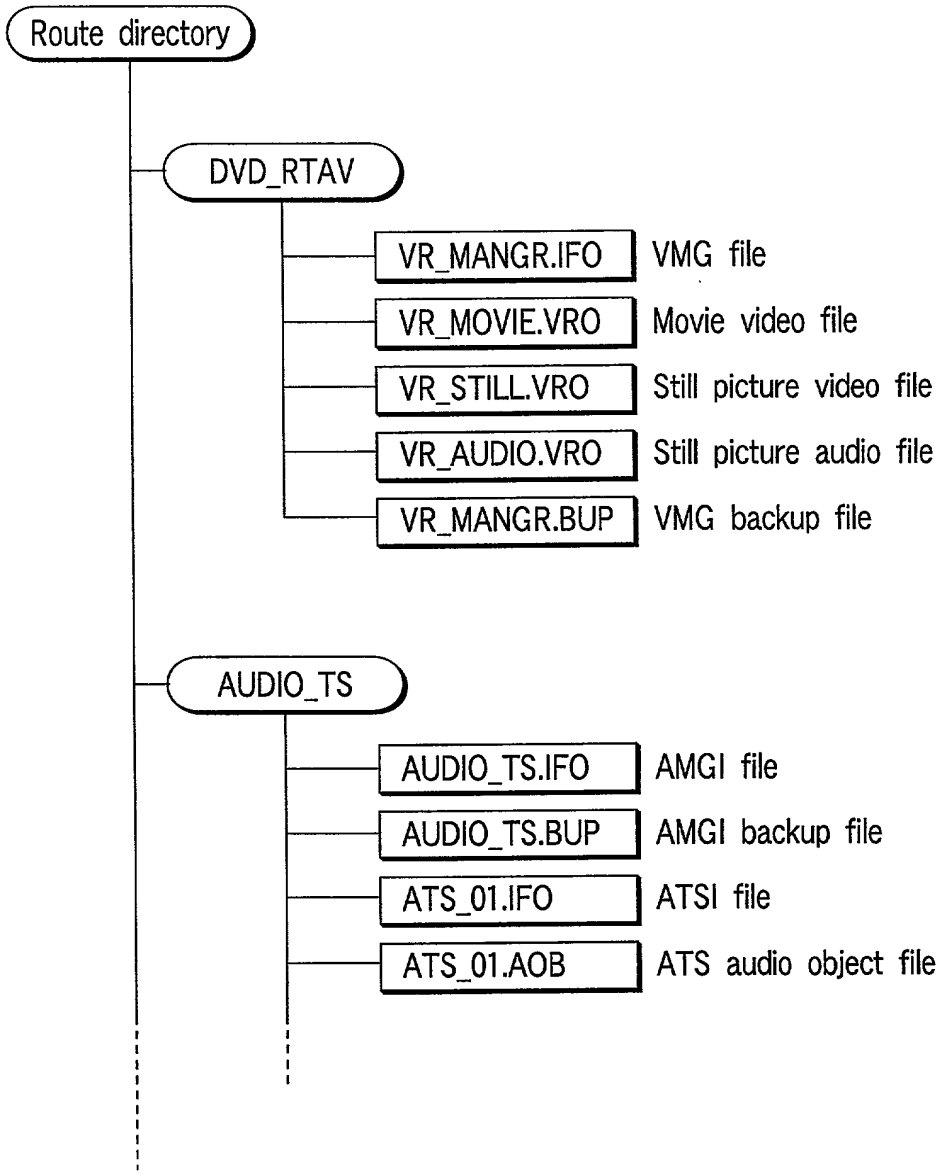
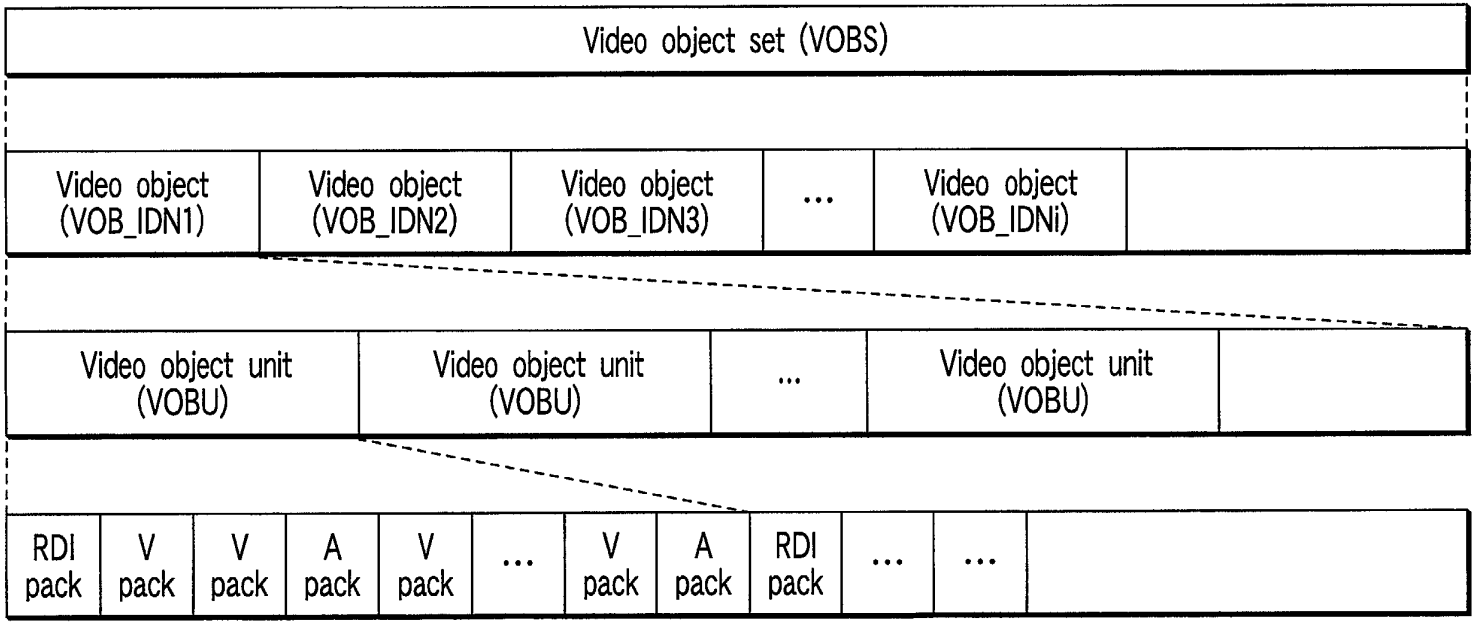

Route directory
DVD_RTAV
VR_MANGR.IFO
VMG file
VR_MOVIE.VRO
Movie video file
VR_STILL.VRO
Still picture video file
VR_AUDIO.VRO
Still picture audio file
VR_MANGR.BUP
VMG backup file
AUDIO_TS
AUDIO_TS.IFO
AMGI file
AUDIO_TS.BUP
AMGI backup file
ATS_01.IFO
ATSI file
ATS_01.AOB
ATS audio object file

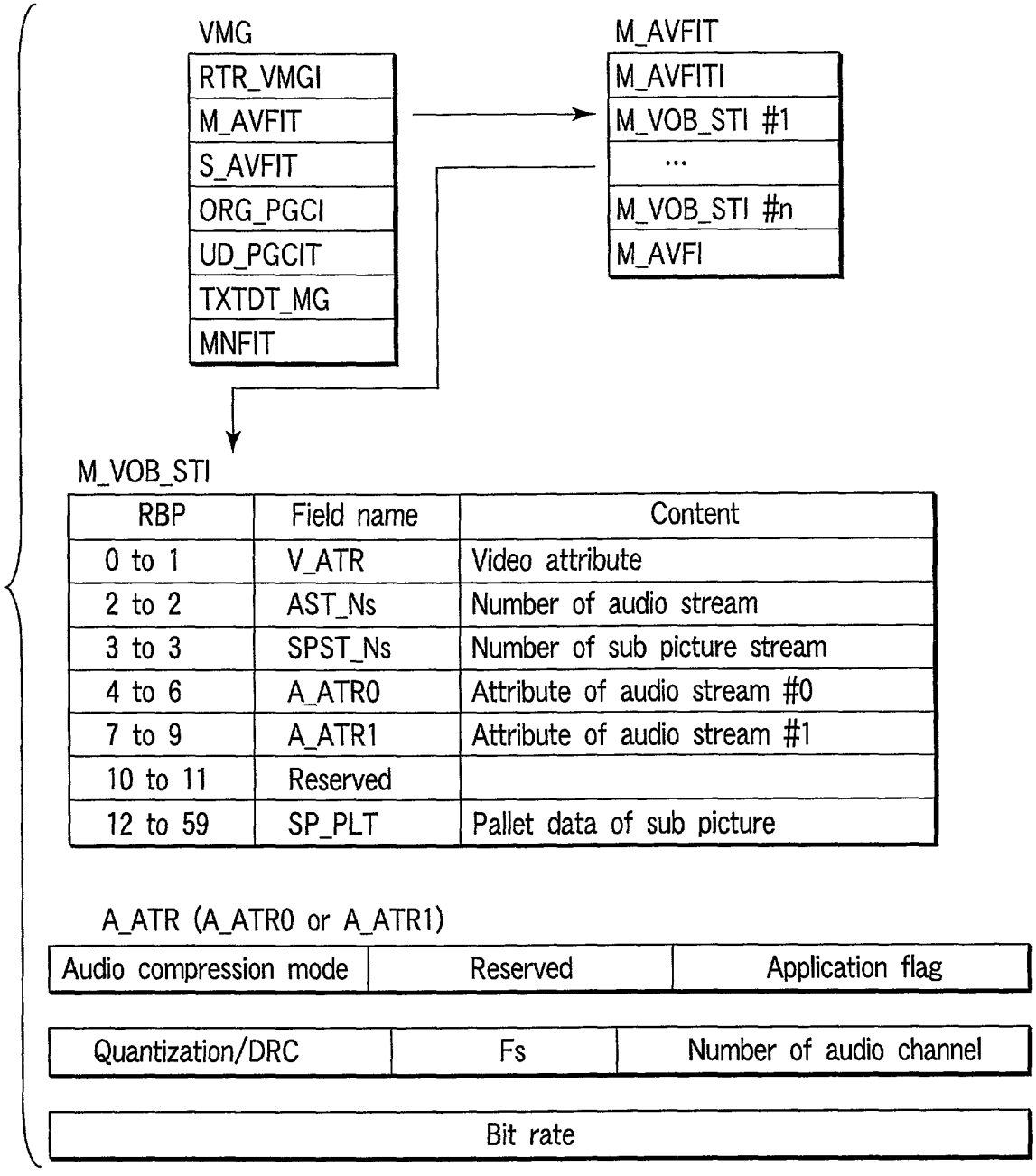
FIG. 2



RDI = real time data information, V = video, A = audio

FIG. 3

EP 0 935 252 A2



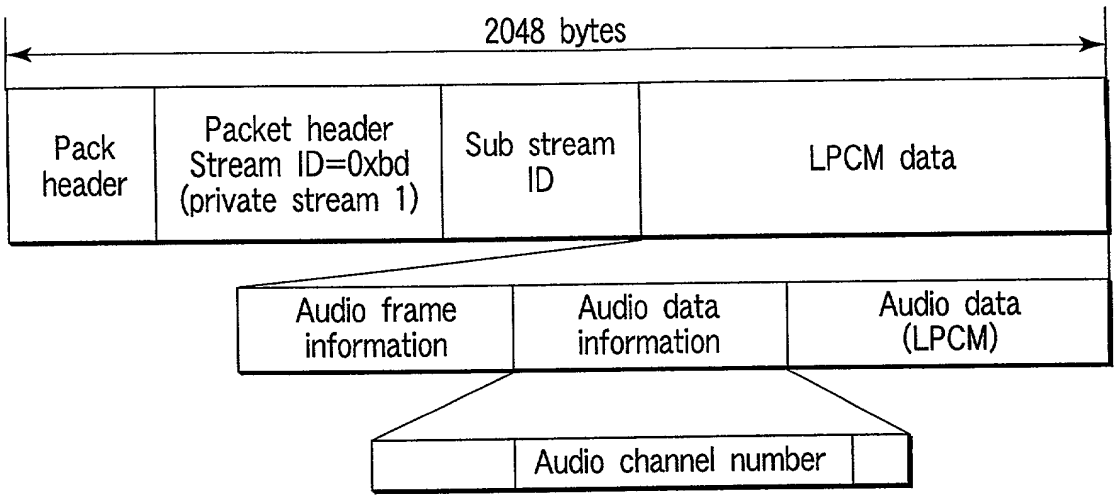
M_VOB_STI

RBP	Field name	Content
0 to 1	V_ATR	Video attribute
2 to 2	AST_Ns	Number of audio stream
3 to 3	SPST_Ns	Number of sub picture stream
4 to 6	A_ATR0	Attribute of audio stream #0
7 to 9	A_ATR1	Attribute of audio stream #1
10 to 11	Reserved	
12 to 59	SP_PLT	Pallet data of sub picture

A_ATR (A_ATR0 or A_ATR1)

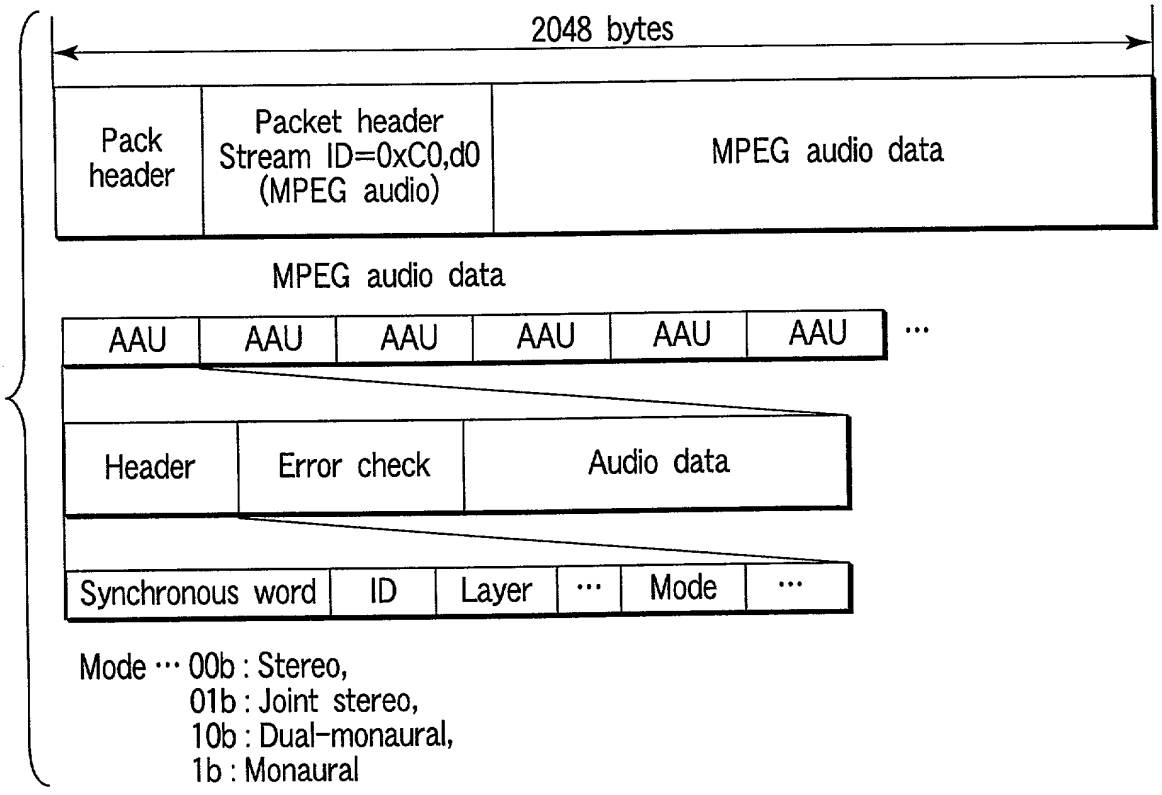
Audio compression mode	Reserved	Application flag
Quantization/DRC	Fs	Number of audio channel
Bit rate		

FIG. 4



Audio channel number ··· 0000b:1ch(monaural),
0001b:2ch(stereo),
1001b:2ch(dual-monaural)

FIG. 5



Mode ··· 00b : Stereo,
01b : Joint stereo,
10b : Dual-monaural,
1b : Monaural

FIG. 6

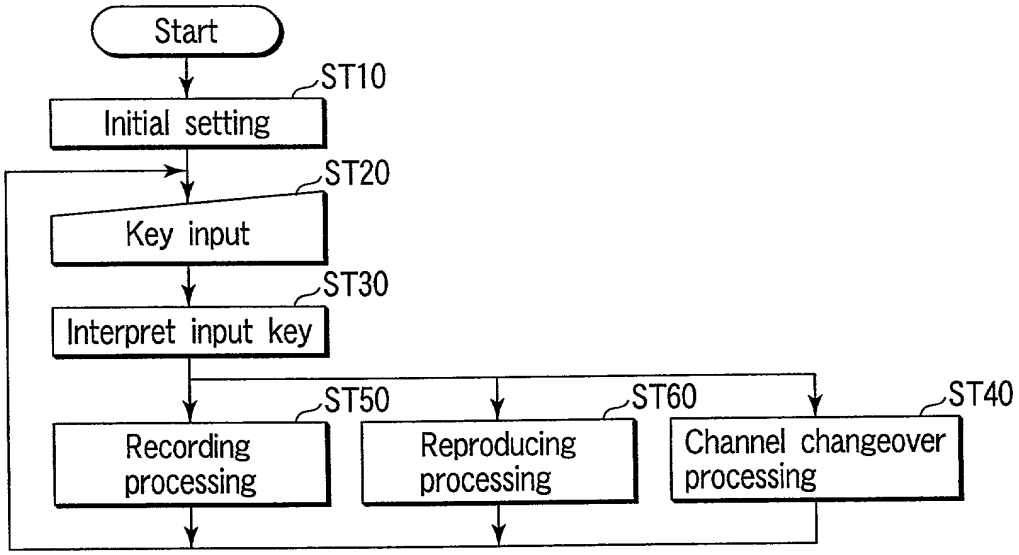

Start
ST10
Initial setting
ST20
Key input
ST30
Interpret input key
ST50
Recording processing
ST60
Reproducing processing
ST40
Channel changeover processing

FIG. 7

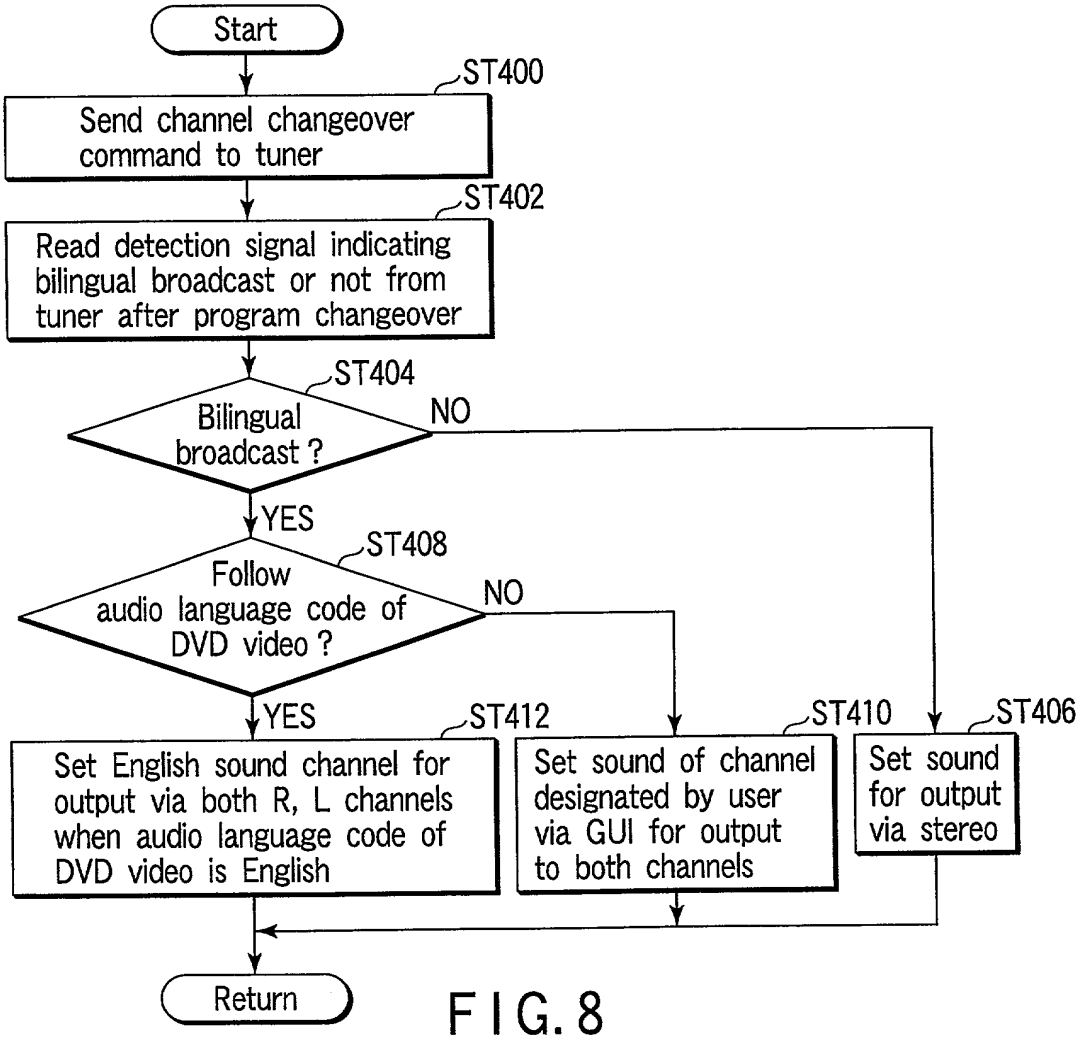

Start
ST400
Send channel changeover command to tuner
ST402
Read detection signal indicating bilingual broadcast or not from tuner after program changeover
ST404
Bilingual broadcast ?
NO
YES
ST408
Follow audio language code of DVD video ?
NO
YES
ST412
Set English sound channel for output via both R, L channels when audio language code of DVD video is English
ST410
Set sound of channel designated by user via GUI for output to both channels
ST406
Set sound for output via stereo
Return

FIG. 8

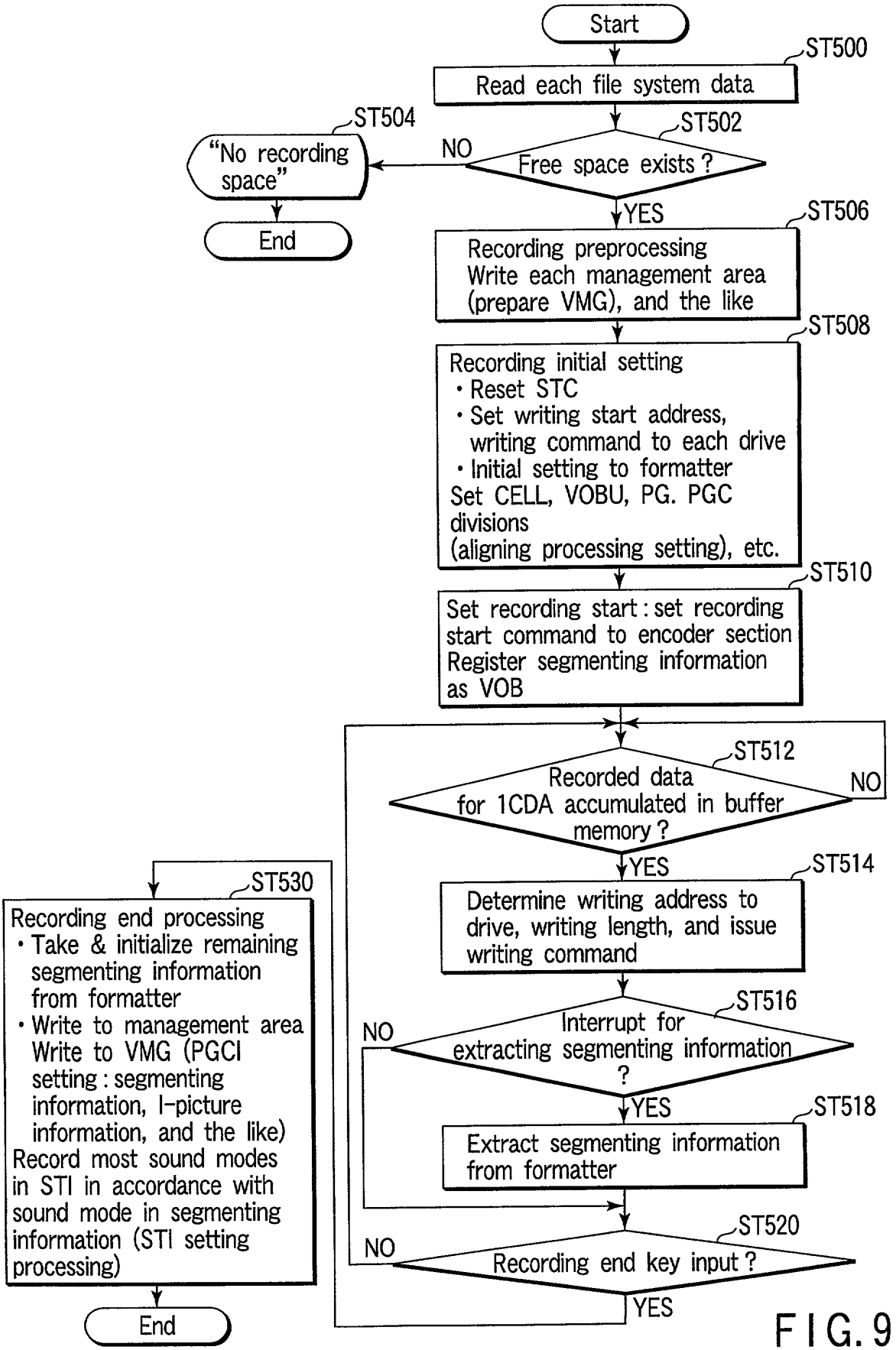

Start
ST500
Read each file system data
ST502
Free space exists ?
NO
ST504
"No recording space"
End
YES
ST506
Recording preprocessing
Write each management area (prepare VMG), and the like
ST508
Recording initial setting
• Reset STC
• Set writing start address, writing command to each drive
• Initial setting to formatter
Set CELL, VOBU, PG. PGC divisions
(aligning processing setting), etc.
ST510
Set recording start : set recording start command to encoder section
Register segmenting information as VOB
ST512
Recorded data for 1CDA accumulated in buffer memory ?
NO
YES
ST514
Determine writing address to drive, writing length, and issue writing command
ST516
Interrupt for extracting segmenting information ?
NO
YES
ST518
Extract segmenting information from formatter
ST520
Recording end key input ?
NO
YES
ST530
Recording end processing
• Take & initialize remaining segmenting information from formatter
• Write to management area Write to VMG (PGCI setting : segmenting information, I-picture information, and the like)
Record most sound modes in STI in accordance with sound mode in segmenting information (STI setting processing)
End

FIG. 9

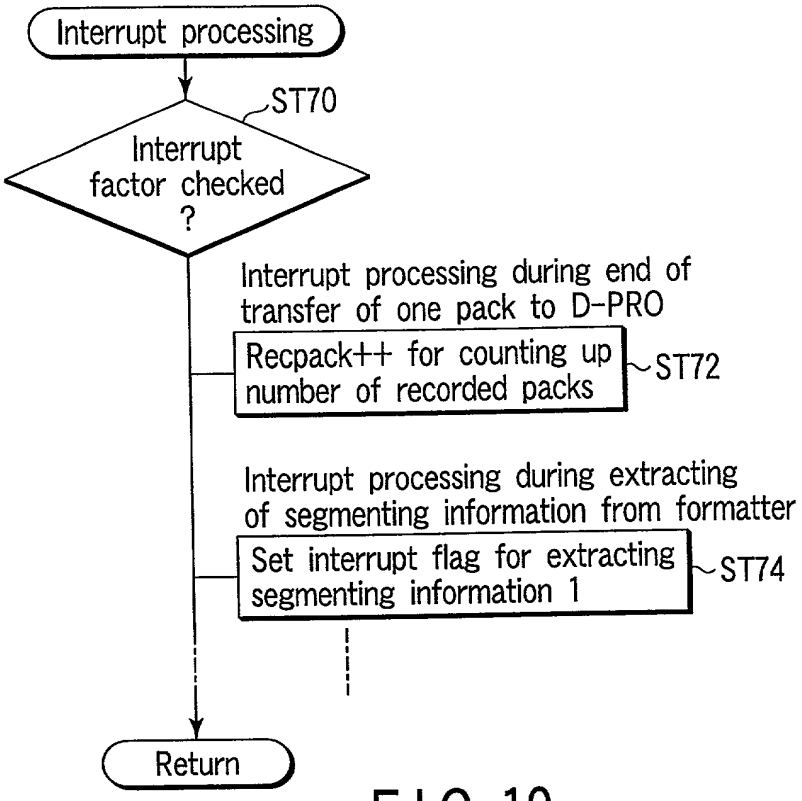

Interrupt processing
ST70
Interrupt factor checked ?
Interrupt processing during end of transfer of one pack to D-PRO
Recpack++ for counting up number of recorded packs
ST72
Interrupt processing during extracting of segmenting information from formatter
Set interrupt flag for extracting segmenting information 1
ST74
Return

FIG. 10

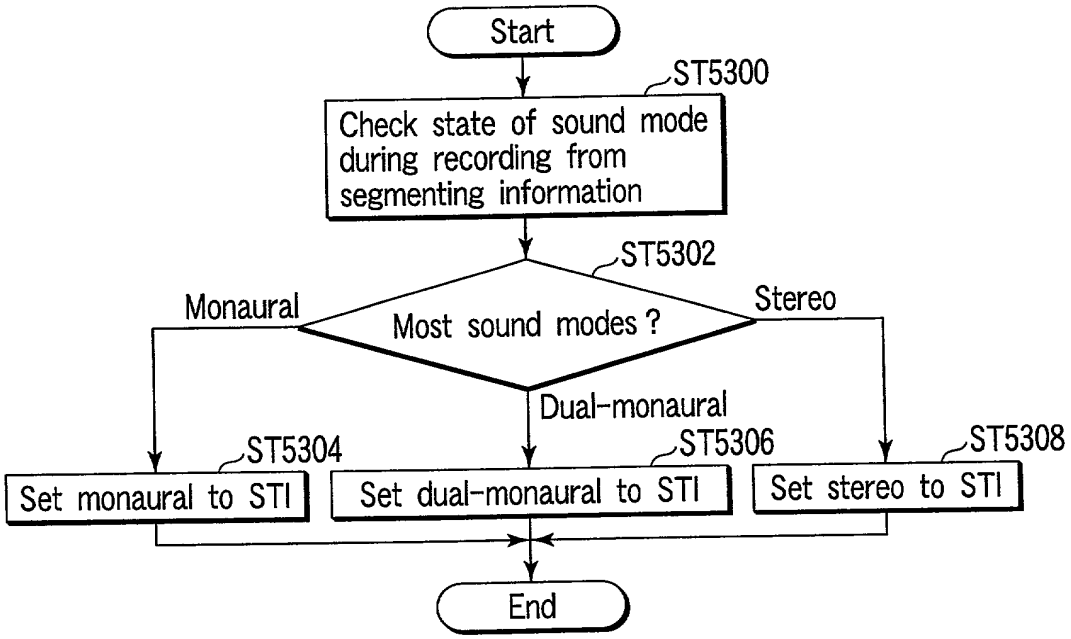

Start
ST5300
Check state of sound mode during recording from segmenting information
ST5302
Monaural
Most sound modes ?
Stereo
Dual-monaural
ST5304
ST5306
ST5308
Set monaural to STI
Set dual-monaural to STI
Set stereo to STI
End

FIG. 11

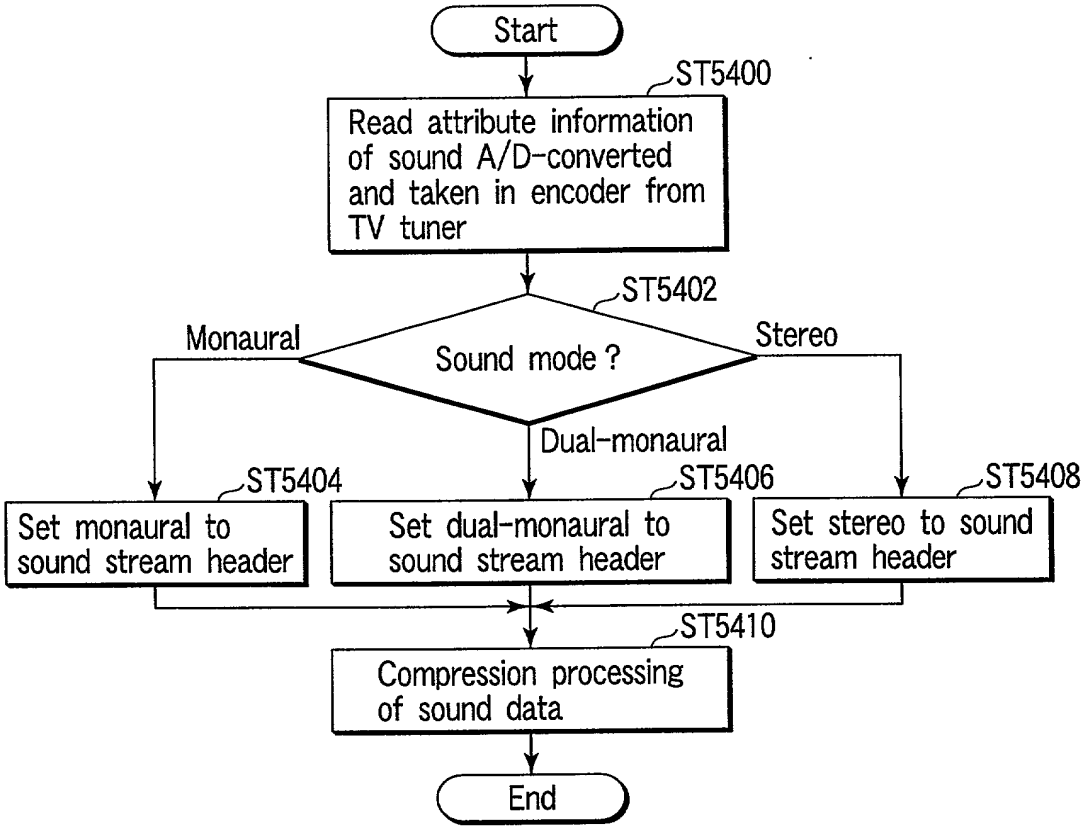

Start
ST5400
Read attribute information of sound A/D-converted and taken in encoder from TV tuner
ST5402
Monaural
Sound mode ?
Stereo
Dual-monaural
ST5404
ST5406
ST5408
Set monaural to sound stream header
Set dual-monaural to sound stream header
Set stereo to sound stream header
ST5410
Compression processing of sound data
End

FIG. 12

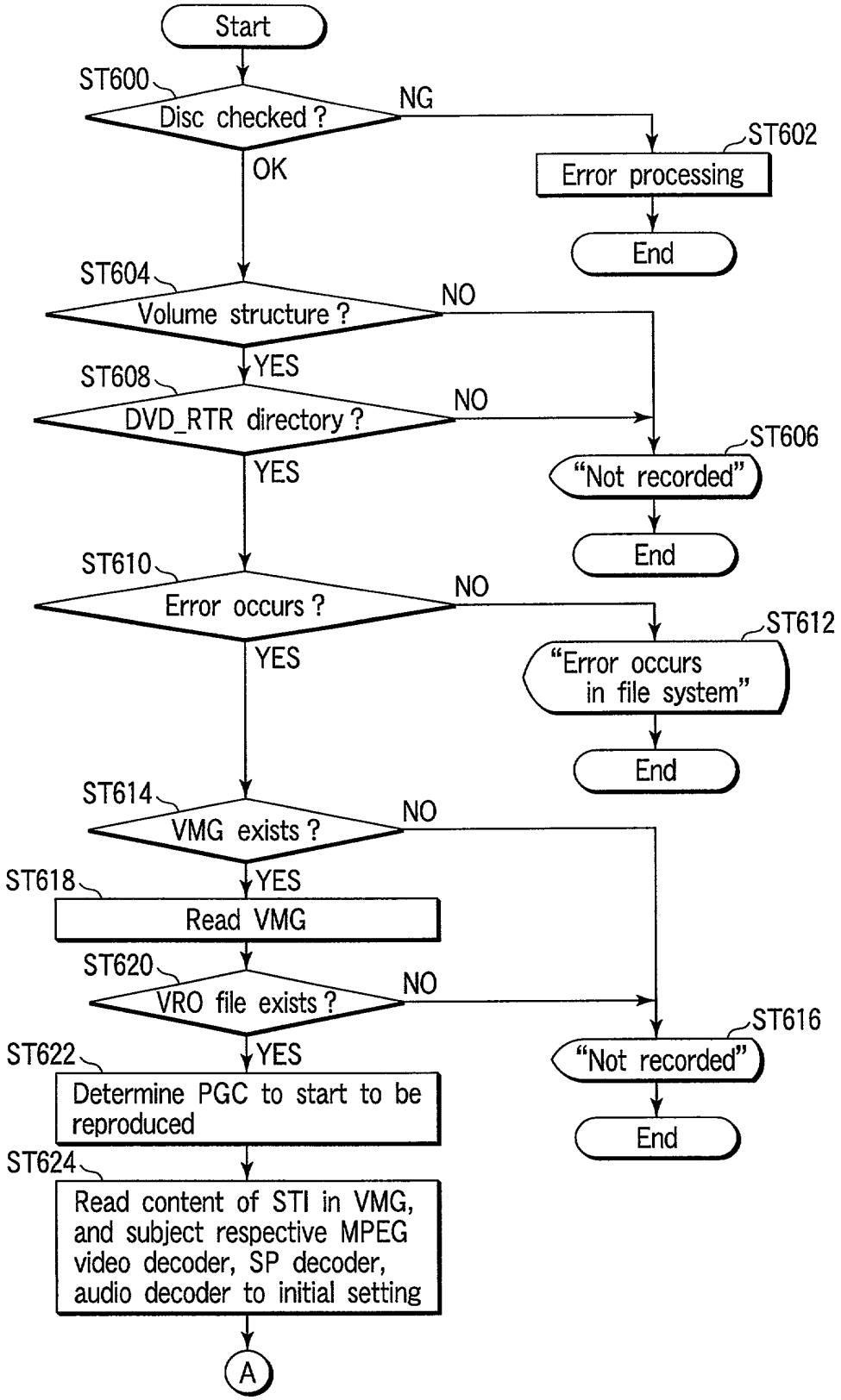

Start
ST600
Disc checked ?
NG
OK
ST602
Error processing
End
ST604
Volume structure ?
NO
YES
ST608
DVD_RTR directory ?
NO
YES
ST606
"Not recorded"
End
ST610
Error occurs ?
NO
YES
ST612
"Error occurs in file system"
End
ST614
VMG exists ?
NO
YES
ST618
Read VMG
ST620
VRO file exists ?
NO
YES
ST616
"Not recorded"
End
ST622
Determine PGC to start to be reproduced
ST624
Read content of STI in VMG, and subject respective MPEG video decoder, SP decoder, audio decoder to initial setting
A

FIG. 13

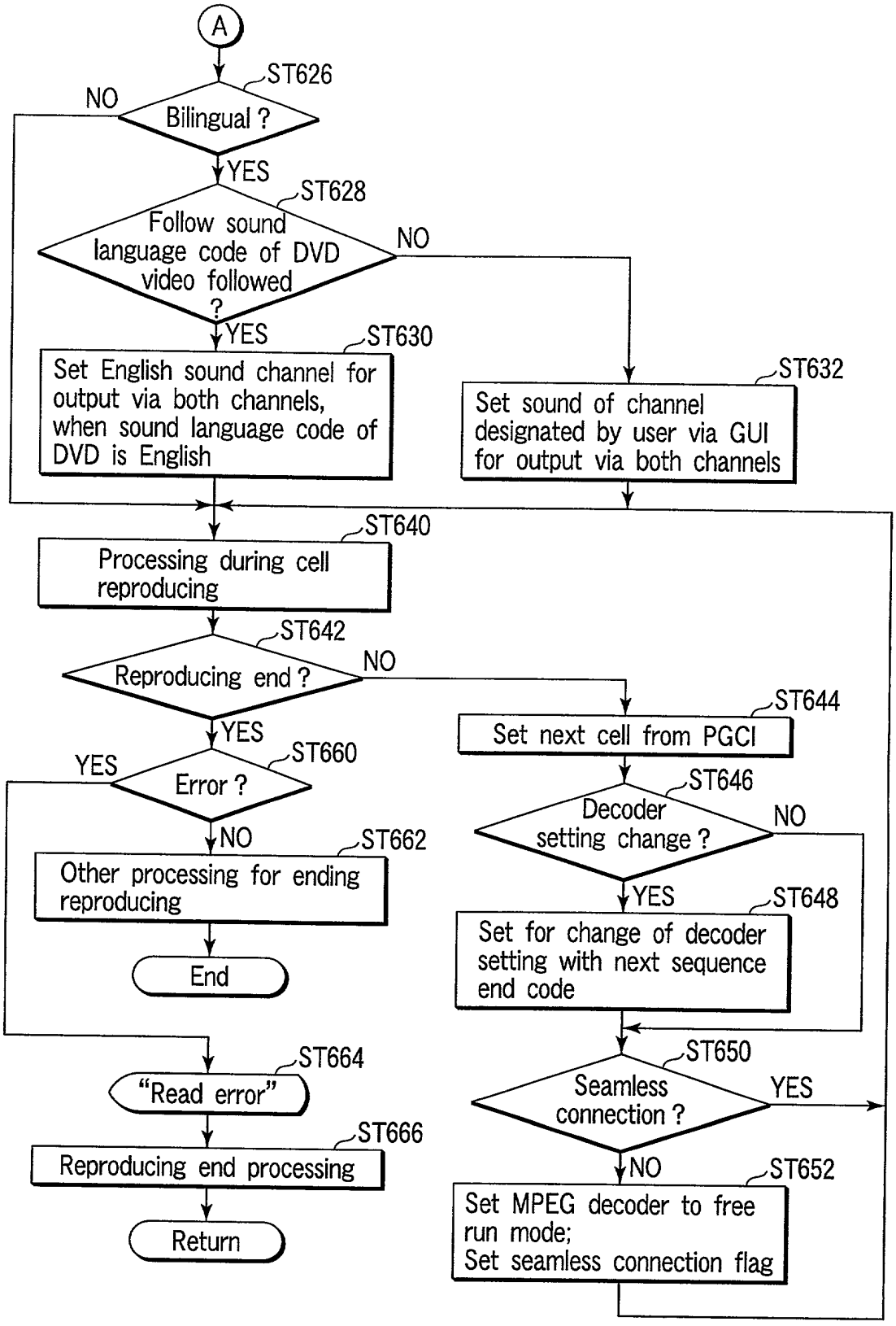

A
ST626
Bilingual ?
NO
YES
ST628
Follow sound language code of DVD video followed ?
NO
YES
ST630
Set English sound channel for output via both channels, when sound language code of DVD is English
ST632
Set sound of channel designated by user via GUI for output via both channels
ST640
Processing during cell reproducing
ST642
Reproducing end ?
NO
YES
ST644
Set next cell from PGCI
ST646
Decoder setting change ?
NO
YES
ST648
Set for change of decoder setting with next sequence end code
ST650
Seamless connection ?
YES
NO
ST652
Set MPEG decoder to free run mode;
Set seamless connection flag
ST660
Error ?
YES
NO
ST662
Other processing for ending reproducing
End
ST664
"Read error"
ST666
Reproducing end processing
Return

FIG. 14

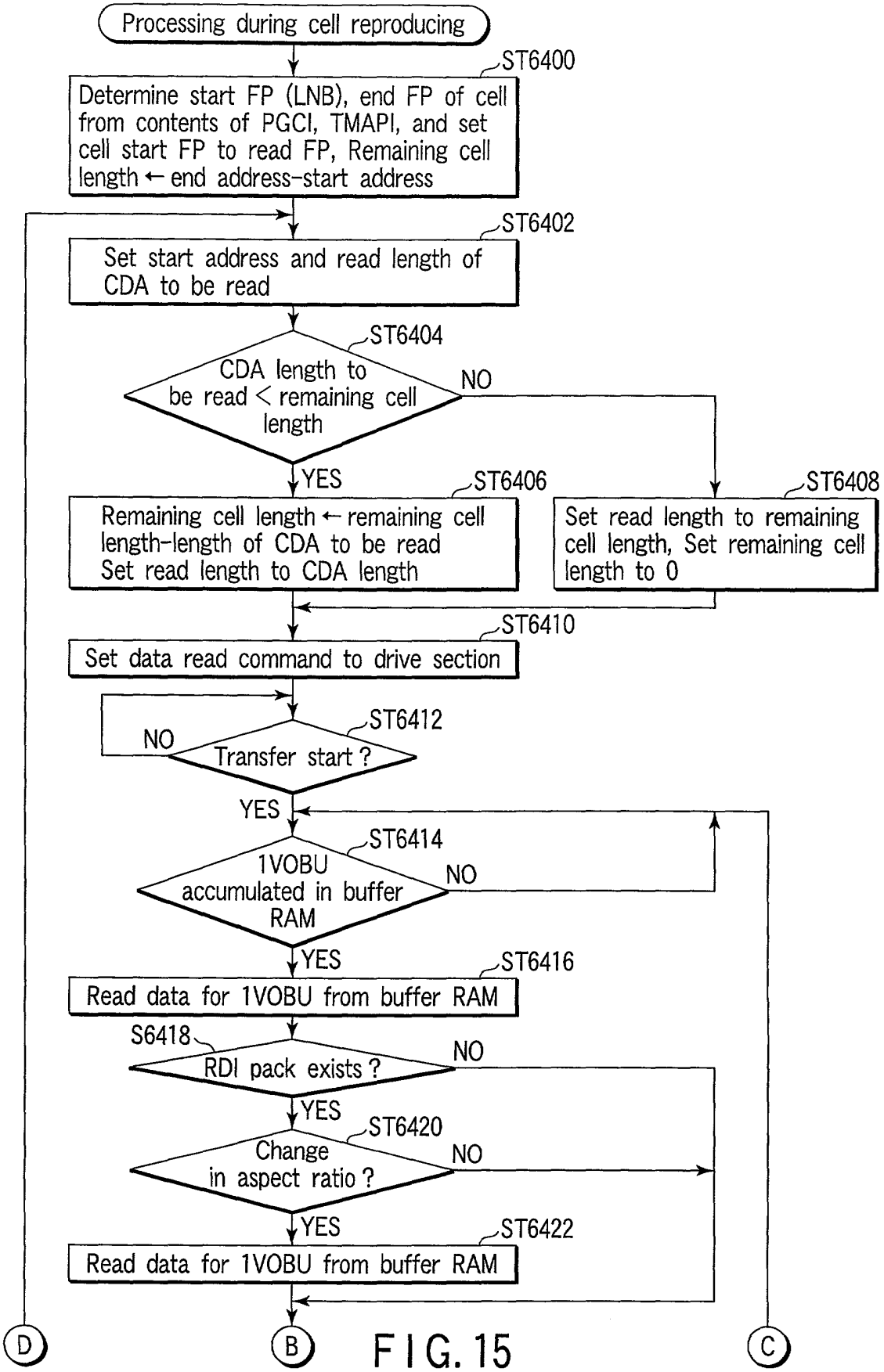

Processing during cell reproducing
ST6400
Determine start FP (LNB), end FP of cell from contents of PGCI, TMAPI, and set cell start FP to read FP, Remaining cell length ← end address-start address
ST6402
Set start address and read length of CDA to be read
ST6404
CDA length to be read < remaining cell length
NO
YES
ST6406
Remaining cell length ← remaining cell length-length of CDA to be read
Set read length to CDA length
ST6408
Set read length to remaining cell length, Set remaining cell length to 0
ST6410
Set data read command to drive section
ST6412
NO
Transfer start ?
YES
ST6414
1VOBU accumulated in buffer RAM
NO
YES
ST6416
Read data for 1VOBU from buffer RAM
S6418
RDI pack exists ?
NO
YES
ST6420
Change in aspect ratio ?
NO
YES
ST6422
Read data for 1VOBU from buffer RAM
D
B
C

FIG. 15

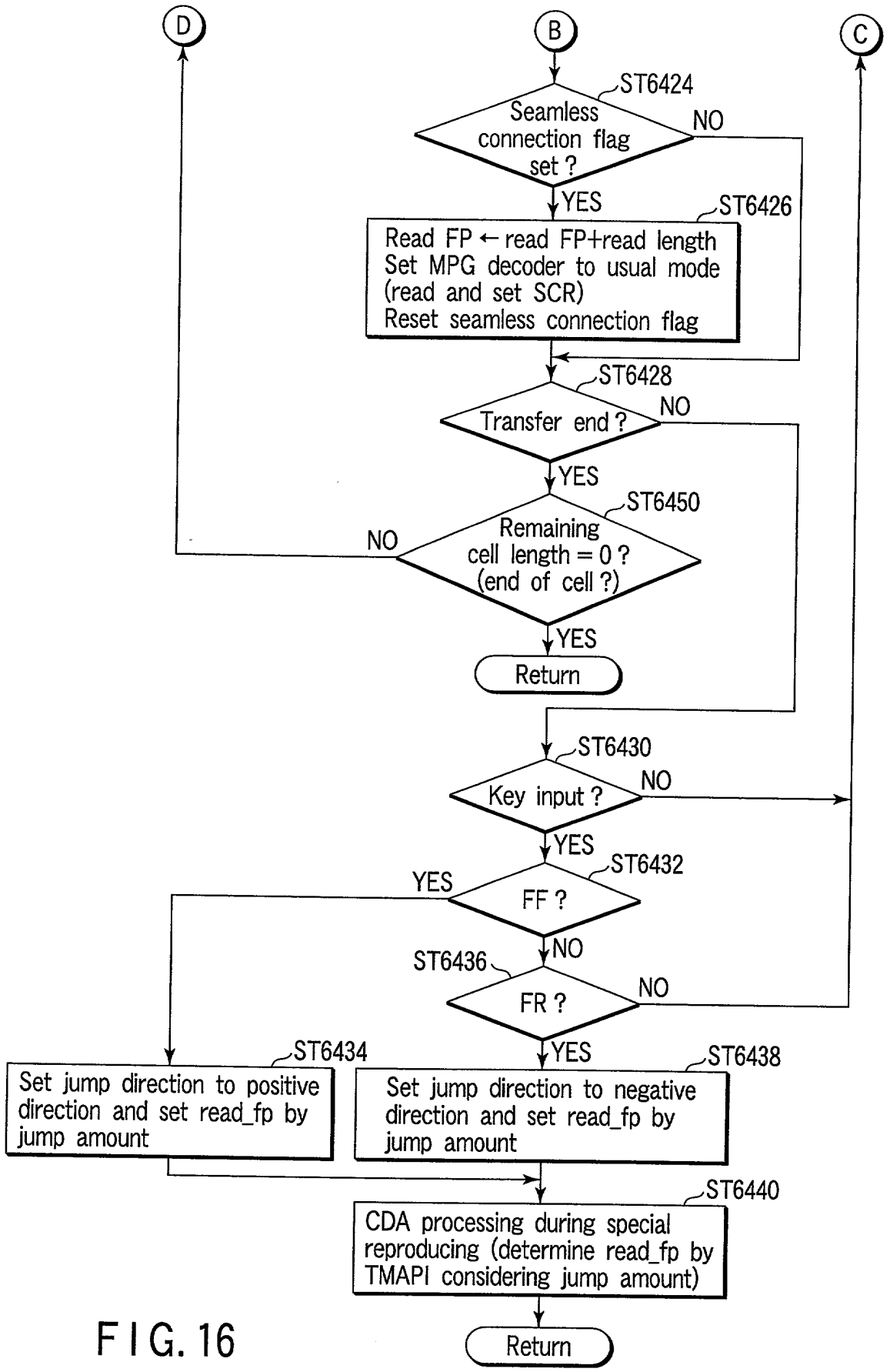

D
B
C
ST6424
Seamless connection flag set ?
NO
YES
ST6426
Read FP ← read FP+read length
Set MPG decoder to usual mode (read and set SCR)
Reset seamless connection flag
ST6428
Transfer end ?
NO
YES
ST6450
Remaining cell length = 0 ? (end of cell ?)
NO
YES
Return
ST6430
Key input ?
NO
YES
ST6432
FF ?
YES
NO
ST6436
FR ?
NO
YES
ST6434
Set jump direction to positive direction and set read_fp by jump amount
ST6438
Set jump direction to negative direction and set read_fp by jump amount
ST6440
CDA processing during special reproducing (determine read_fp by TMAPI considering jump amount)
Return

FIG. 16

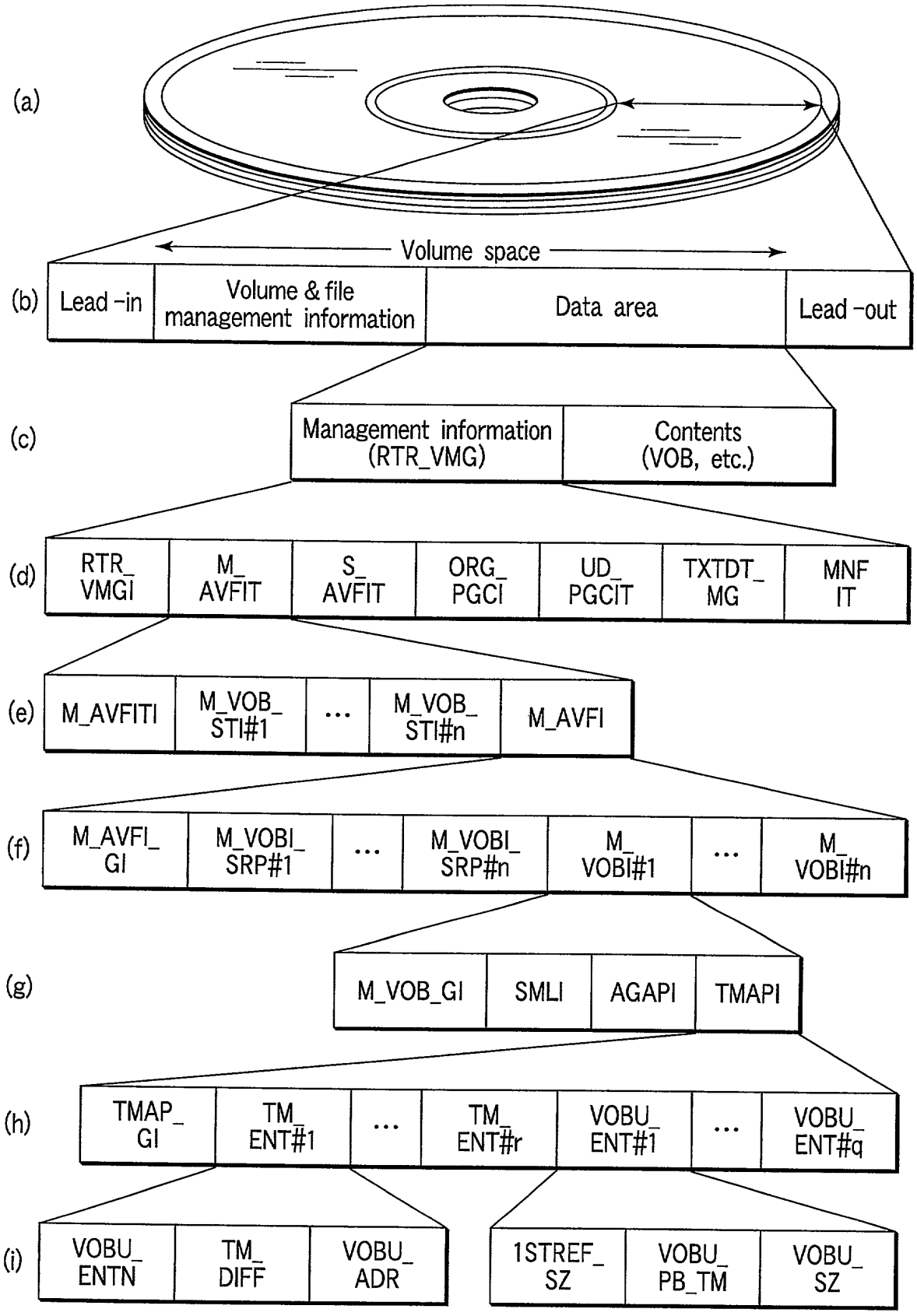

(a)
Volume space
(b)
Lead -in
Volume & file management information
Data area
Lead -out
(c)
Management information (RTR_VMG)
Contents (VOB, etc.)
(d)
RTR_ VMGI
M_ AVFIT
S_ AVFIT
ORG_ PGCI
UD_ PGCIT
TXTDT_ MG
MNF IT
(e)
M_AVFITI
M_VOB_ STI#1
...
M_VOB_ STI#n
M_AVFI
(f)
M_AVFI_ GI
M_VOBI_ SRP#1
...
M_VOBI_ SRP#n
M_ VOBI#1
...
M_ VOBI#n
(g)
M_VOB_GI
SMLI
AGAPI
TMAPI
(h)
TMAP_ GI
TM_ ENT#1
...
TM_ ENT#r
VOBU_ ENT#1
...
VOBU_ ENT#q
(i)
VOBU_ ENTN
TM_ DIFF
VOBU_ ADR
1STREF_ SZ
VOBU_ PB_TM
VOBU_ SZ

FIG. 17